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Completely caught off guard: a new record of Jaguar, *Panthera onca* (Linnaeus, 1758) (Mammalia, Felidae), from an urban park

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Abstract

Jaguar, *Panthera onca* (Linnaeus, 1758), is a paramount predator that contributes to ecosystem balance but rarely inhabits small conserved areas. We report a new record of a Jaguar in Brasilia National Park that was photographed while monitoring the Giant Anteater (*Myrmecophaga tridactyla* Linnaeus, 1758) population using camera traps. This Jaguar record is critical in documenting the presence of this species in highly human-inhabited and urbanized areas. Our new record also contributes to the understanding of the current distribution of remaining individuals and confirms the importance of large-scale protected areas in providing habitat for species, such as jaguars, that have large ranges.

Keywords

Camera trap, distribution, Felidae, human-modified landscapes, mammal, urban area

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Introduction

Jaguar, *Panthera onca* (Linnaeus, 1758), is the largest wild felid in the Americas and the third-largest cat in the world. This species occurs from the southwestern United States to northern Argentina (Wilson and Reeder 2005; De la Torre et al. 2017; Quigley et al. 2017). The current range of the species is estimated at 8.75 million square kilometers, or approximately 46% of its historical distribution (Franco et al. 2018). Roughly, half of this range lies within Brazilian territory. Brazil presents the most extensive variety of habitats for Jaguar (Astete et al. 2008). Nowadays, Jaguars are found in all Brazilian biomes, except for Pampa, where it is extirpated (Morato et al. 2018). Jaguars are opportunistic carnivores, and the main prey species are capybara, deer, peccary, sloth, and crocodile among the more than 85 species recorded in their diet (Franco et al. 2018). Jaguars are categorized by the International Union for the Conservation of Nature as Near Threatened (Quigley et al. 2017), but in Brazil, the species is categorized as Vulnerable (Desbiez et al. 2013), with estimates of population decline at a rate of approximately 30% in less than 30 years due to habitat loss and hunting. Currently, studies estimate Brazil's mean Jaguar population size at 10,000–87,000 individuals (Sollmann et al. 2008; Jędrzejewski et al. 2018; Morato et al. 2018).

The replacement of natural areas by urbanization, croplands, and grazing lands promotes the reduction of the current range of the species (Moraes Jr. 2012; Zanin

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et al. 2015; Thompson et al. 2021). In Brazil, devegetation has intensely affected the Cerrado, a Brazilian savanna-like biome (Strassburg et al. 2017; Hofmann et al. 2021), because regardless of the spatial arrangement of habitat fragments, landscape connectivity is lost when the remaining natural habitat falls below a certain threshold (Grande et al. 2020). Thus, because top predators such as large felids are vulnerable to habitat loss and fragmentation, Jaguars in Cerrado seek extensive areas with an abundance of large prey within their range (Ripple et al. 2014). Factors such as high mortality and isolation of the populations threaten the long-term survival of the species (McManus et al. 2015; Oliveira et al. 2021), as Jaguars use as refuges small natural fragments surrounded by a human landscape (Roques et al. 2015; Finnegan et al. 2020). Thus, the federally protected areas play a crucial role in conserving the species by supplying suitable conditions for its maintenance, such as food resources, protection, and shelter (Woodroffe 2001; Sanderson et al. 2002; Carranza et al. 2014; Portugal et al. 2020).

Brasília National Park (PNB) is the largest Cerrado fragment in the Distrito Federal, Brazil. It has an area of 424 km^2 and is part of the Cerrado Biosphere Reserve. PNB presents many phytophysiognomies, ranging from gallery forests to typical Cerrado *sensu stricto* and open grassland. The park vitally harbors threatened mammalian species, such as the Maned-wolf [*Chrysocyon brachyurus* (Illiger, 1815)], Giant Anteater (*Myrmecophaga tridactyla* Linnaeus, 1758), and Giant Armadillo [*Priodontes maximus* (Kerr, 1792)] (Funatura/Ibama 1998). In addition to conserving fauna and flora, PNB aims to raise awareness of the Cerrado environment. PNB is located less than 10 km from the urban center of the city of Brasília. It has a designated area that is open to public visitation with trails and natural pools (Funatura/Ibama 1998). The park is under intense human influence, surrounded by high-speed highways, settlements, and farms (Funatura/Ibama 1998). Because of the park's favorable location, invasions by domestic dogs and poachers are widespread, and this poses a severe threat to its fauna (Lacerda et al. 2009; P.B. Petrazzini pers. obs.). Despite some indirect evidence, Jaguar sightings have been rare since the foundation of PNB. Here, we confirm the presence of a Jaguar in the central portion of PNB, a park that fully within a human-dominated landscape.

Methods

We conducted the study in the Brasília National Park. In 1961 the park was created with approximately 30,000 ha, and in 2006 the northern limits of the park were expanded; the park now totals 42,389 ha (Fig.1). PNB has a temperate, humid climate with an average temperature of the coldest month below 18 °C and the hottest month around 22°C. The average annual precipitation is 1600 mm per year, with most rain falling in November to April (monthly averages up to 300 mm). In 2020 and 2021, we undertook two survey campaigns per year, one in the rainy months (January–March) and the other in the dry period (July–September). We installed camera traps (Campark Models T40 and T86) at 57 study sites, which were sampled in rotation and roughly 1 km apart, to investigate the occupancy patterns of Giant Anteater

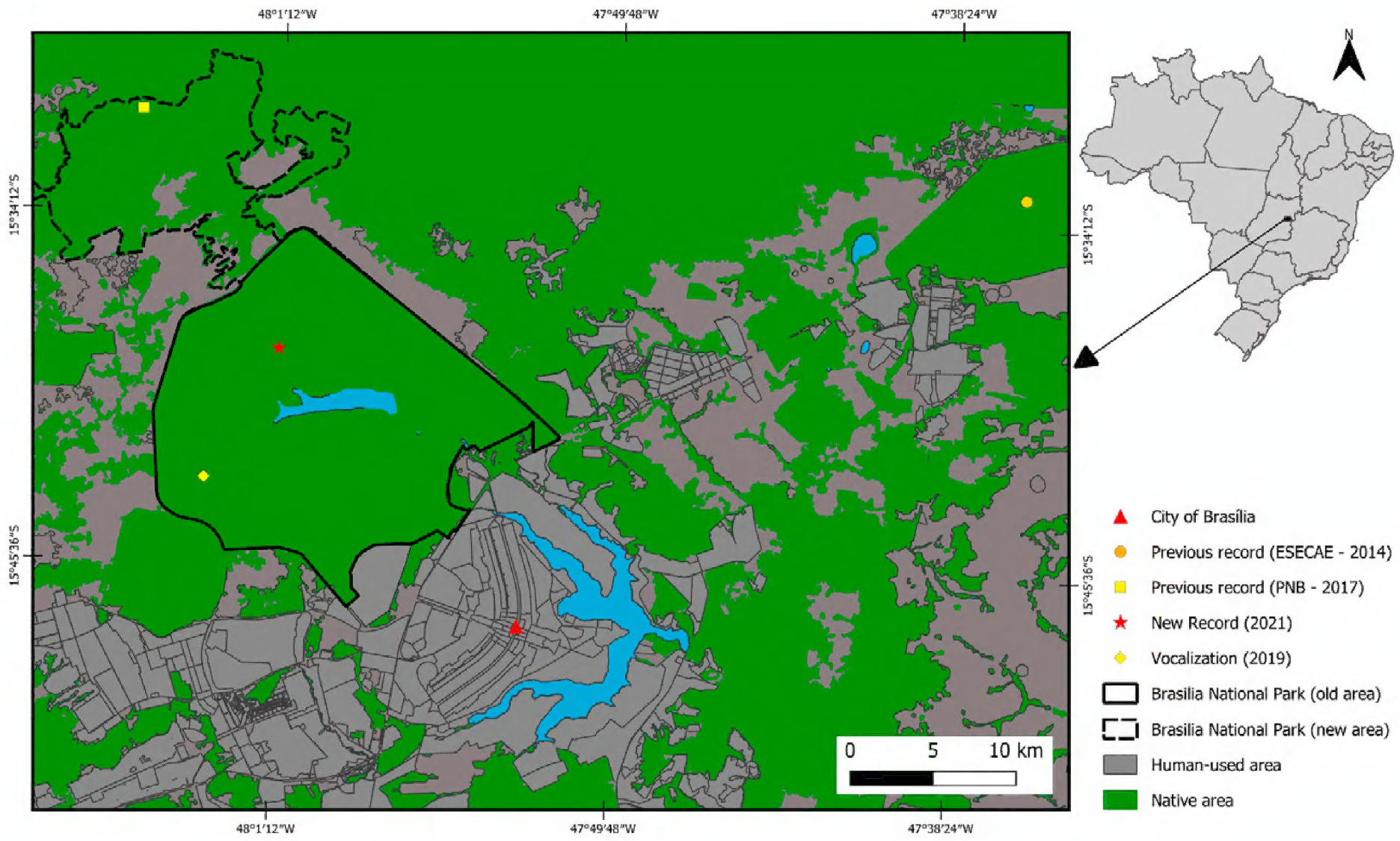

Figure 1. Geographic distribution of Jaguar, *Panthera onca*, in the Distrito Federal, Brazil. Previous (circle, square, and diamond) and new (star) records obtained by camera trap near highly anthropogenic (gray) areas.

(*Myrmecophaga tridactyla* Linnaeus, 1758) during the rainy and dry seasons. Each camera remained active 24 h/day for 30 consecutive days and was programmed to take pictures at 1-min intervals. We also surveyed the occurrence of Jaguar in databases (GBIF, iNaturalist, and IBAMA) and in the literature to understand the historical distribution of the species.

Results

In the first two years of research, the total effort was 6,840 trapping days. In September 2021, in the fourth monitoring campaign using camera traps, we obtained a record of one adult Jaguar of unidentified sex in the PNB (Fig. 1). The Jaguar (Fig. 2) was photographed in a Cerrado *sensu stricto* phytophysiognomy near a dirt road and stream. This record was from the original area of the PNB, which is close to urban constructions, a high population density, and highways, approximately 30 km from the center of the country's capital (data uploaded: https://doi.org/10.15468/dz6zuy).

New record. BRAZIL – Distrito Federal • Brasília; Parque Nacional de Brasília; 15°38′12″S, 048°02′21″W; 1250 m altitude; 25. IX.2021; photographed at 19.15 h; Priscilla Braga Petrazzini obs.; wildlife camera trap (Fig. 2).

Identification. Jaguar is recognized by its distinctive characteristics: a large and robust body, patterned with black spots in the form of rosettes with dots inside (Oliveira and Cassaro 2005; Reis et al. 2006).

Remarks. According to the occurrence data obtained from the ICMBIO dataset (ICMBio 2021), GBIF.org (GBIF 2021), the National Action Plan for Jaguar in Brazil (Desbiez et al. 2013), and the Brazilian Red List (Morato et al. 2018), there is no previous confirmed records of Jaguar from this park or the Distrito Federal. There are also no occurrences reported in the literature. However, there are informal records of Jaguar from areas near the PNB; most of this information comes from social media and websites (IBRAM 2014), television reports (Marques 2018), and tourist notifications.

Discussion

Our study reports a new visual record of a Jaguar within the PNB. This is essential data because it is the first photograph of this species from the original part of the PNB, which is within the administrative area of Brasília

Figure 2. Jaguar, *Panthera onca*, in Brasília National Park, Distrito Federal, Brazil.

and less than 20 km from the center of the city. The new record shows that this Jaguar individual is using the area closest to the urban center and with the greatest human population density. Jaguar has been considered locally extirpated since the foundation of PNB in 1961. Other camera-trap studies within the park have not recorded the species (Juarez 2008; Oliveira 2010). In 2017, a first visual record of the species in the PNB was made (Marques 2018), but from a newly incorporated area of the park which is further north of the city (F.H.S. Soares pers. communication); where the landscape is relatively more preserved and surrounded by agriculture (Fig. 1). This previous camera-trap record and our new record are over 15 km apart. In October 2019, during a bat study, one of us (Petrazzini) and other bat researchers heard the characteristic roar vocalization of a Jaguar at around 10:00 p.m. Despite the evidence, no other visualization of the species occurred until our recent camera trap record in September 2021. Even though in the same park, the two camera-trap records are over 15 km apart. The new record and previous reports of Jaguar in and near the park show that the species is still using these areas.

Our record of this threatened feline from a peri-urban protected area is a positive sign. Top predators, such as Jaguar, are essential for maintaining the health of an ecosystem (O'Bryan et al. 2018). These animals control populations of their prey and maintain the balance of the ecological system (Estes et al. 2011; Colman et al. 2014; Ripple et al. 2014). Furthermore, the new record is a sign that the PNB serves as a refuge for this species in an anthropogenic landscape of settlements, highways, and agricultural areas (Funatura/Ibama 1998). Despite intense human influence, the PNB is fulfilling its function of protecting fauna. According to the National Action Plan for the Jaguar in Brazil (Desbiez et al. 2013) and the Brazilian Red List (Morato et al. 2018), Jaguar is classified as Endangered in the Cerrado biome, and there was no mention of the species occurring in the park or in the state in any of this official occurrence lists, and there is no confirmed record of the species in this park or district. Our record is of value in conservation of this threatened species, helping to track its distribution. Locally, this record should motivate environmental managers to reduce impacts that affect the availability to Jaguar of resources and ensure its coexistence in close proximity with humans in this park. Species that areas in proximity to high human density are more vulnerable to habitat loss (Cardillo et al. 2004; McDonald et al. 2008; De la Torre et al. 2017; Di Marco et al. 2018; Romero-Muñoz et al. 2019).

Despite intense urban growth, our contribution highlights how Jaguar survives in Brasilia. The reduction of natural environments due to expanding agriculture and cattle pastures increase deforestation and lead to greater contact between Jaguars and humans. The long-term persistence of Jaguar in the PNB is unknown because we are unclear if the animal photographed was passing through, dispersing, or setting up territory at the site. However, the individuals photographed in 2017 and 2021 are different. As observations are rare and there is no massive monitoring effort, it is difficult to know if these individuals are still occupying the PNB. We recommend further studies to understand the habitat use of Jaguar in the PNB and the possibility of other individuals using the park. More information is essential for managing the PNB and protecting this endangered species in the Cerrado biome.

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Authors' Contributions

Conceptualization: LMSA, PBBP. Funding acquisition: PBBP. Investigation: PBBP. Methodology: LMSA, PBBP. Supervision: LMSA. Visualization: LMSA, PBBP. Writing – original draft: PBBP. Writing – review and editing: LMSA, PBBP.

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